

**Description of the tadpole of *Strongylopus hymenopus*  
(Boulenger, 1920) (Amphibia: Anura: Ranidae)  
and a key to described southern African tadpoles of the genus**

by

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**ABSTRACT**

Tadpoles of *Strongylopus hymenopus* are described on the basis of material reared through metamorphosis and re-examination of material in the Natal Museum, and are compared with those of related species. A key to the described tadpoles of *Strongylopus* species known to occur in southern Africa is provided.

The large, round, dorsally directed spiracle, fully visible from above, the presence of an umbraculum, and the infrarostral keratodont formula, clearly separate these tadpoles from those described and called *Rana hymenopus* by Wager (1965); the status of the latter tadpoles is still under investigation.

Morphologically, newly metamorphosed froglets do not differ significantly from adults.

**INTRODUCTION**

*Strongylopus hymenopus* occurs in the high mountains of the Natal Drakensberg and Lesotho. Wager (1965) briefly described and illustrated tadpoles that he referred to *Rana hymenopus* on the grounds that they had been found in close proximity to adults of that form; he did not succeed in rearing any through metamorphosis. Van Dijk (1966) included *Strongylopus hymenopus* in his keys to known South African tadpoles, separating it from *S. wageri* (Wager, 1961) on differences in pigmentation of the posterior portion of the tail, but without giving a description of the tadpole; his key has subsequently been confirmed to be reliable in this respect.

On 14 June 1985 Mr P. J. Thomson of the Natal Parks Board collected some tadpoles for me from the Tugela River, 700 metres NE of Crow's Nest Peak, Natal Drakensberg (2828DD: 28°45'10''S, 28°53'20''E), at an altitude of 2 960 metres; they were found under ice, in shallow water, on a sand/pebble substrate.

Several of these tadpoles were identified as *Rana vertebralis* Hewitt, 1927, but the remainder could not be satisfactorily identified because of discrepancies between Wager's description and illustrations, and Van Dijk's key. Some were preserved immediately and the rest kept alive for rearing through metamorphosis. Since they showed signs of hyperthermic distress at water temperatures approaching 8°C, they were kept in a domestic refrigerator and gradually acclimatised to higher temperatures over a period of several weeks. They were successfully reared to froglets, some being preserved at various stages of development.

Froglets of the unidentified tadpoles proved to be indistinguishable from *Strongylopus hymenopus* as currently recognised (Poynton 1964), and tadpoles in the Natal Museum labelled as *Rana hymenopus* (including Wager's specimens)

were re-examined. The Natal Museum material falls into two clearly defined groups—(A) tadpoles identical to those described and figured by Wager; and (B) tadpoles identical to those reared by myself, and referable to *S. hymenopus* on the basis of post-metamorphic froglets.

Although the two groups are superficially similar, they are readily separable on characters discussed below. The identity of 'Wager's tadpole' is discussed under 'Remarks'.

#### MATERIALS AND METHODS

Material examined is held in the Natal Museum (NM) and in the author's collection (AJL). Post-metamorphic material examined for confirmation of identification is indicated by asterisks.

'Basutoland' (NM 6002–5); Cathedral Peak (NM 2773 + 4); Cathkin Peak (NM 651, 2772, 6452); Champagne Castle Hostel (NM 926); Tugela River, 700 m NE Crow's Nest Peak (AJL 2253, 2331–4, 2335\*–40\*); 2,4 km NW entrance gate to Giant's Castle Game Reserve (AJL 2348); Mont-aux-Sources summit (NM 904); Royal Natal National Park (NM 271, 6001); Sani Pass (NM 6227, 6283, 6400–2).

Much of the NM material is old and somewhat distorted, precluding accurate measurements. Six of the tadpoles from group A and eight from group B were examined and measured in detail; the remainder (some 100 specimens) were examined only for non-measurable characters, e.g. shape and orientation of spiracular opening, structure and nature of oral disc, papillae, rostrodonts, keratodont formulae, pigmentation patterns, etc. Six tadpoles in my collection were examined and measured in detail, and six postmetamorphics were compared in detail with material in the Natal Museum; this material was freshly preserved.

Snout-vent lengths and tail lengths were measured to 0,05 mm with vernier calipers under a 15× mounted lens; all other measurements were made to 0,02 mm, using a dissecting microscope with eyepiece graticule. All measurements are the means of at least three separate readings.

Staging of tadpoles follows Gosner (1960); terminology and the framework of diagnostic characters follows Van Dijk (1966).

#### KEY TO DESCRIBED TADPOLES OF SOUTHERN AFRICAN *STRONGYLOPUS*

Data for the separation of *Strongylopus springbokensis* Channing, 1986 in this key are from Channing (1986); data for the separation of other taxa are derived from an examination of preserved material in NM and AJL collections. I have not been able to trace reliably identified tadpoles, or reliable descriptions of tadpoles, of *S. bonaspei*.

- 1 Maximum height of tail greater than height of body; dorsal fin mottled, extending forwards onto base of body; tip of tail rather pointed **S. f. fasciatus**
- Maximum height of tail less than, or subequal to, depth of body; dorsal fin not mottled, not extending forwards onto base of body . . . . . 2
- 2 No elygium or umbraculum; dorsal fin not distinctly narrowed anteriorly; distal part of tail not heavily pigmented . . . . . 3
- Umbraculum present; dorsal fin distinctly narrowed anteriorly; distal part of tail may be heavily pigmented black . . . . . 5

- 3 Usually one divided aboral and two undivided adoral rows of infrarostral keratodonts ..... 4
- Usually three undivided rows of infrarostral keratodonts ..... **S. g. grayii**
- 4 Suprarostal keratodonts in two undivided and one divided rows; infra-angular papillae in double rows laterally, single mentally ..... **S. grayii rhodesianus**
- Suprarostal keratodonts in one undivided and three divided rows; infra-angular papillae in a single row only ..... **S. springbokensis**
- 5 Distal portion of tail heavily pigmented black; spiracular opening small, slightly constricted, elliptical, directed posterodorsally; margins of fins more or less parallel; tip of tail round ..... **S. wageri**
- Distal part of tail not heavily pigmented black; spiracular opening large, round, dorsally directed, entirely visible from above; margins of fins somewhat convergent posterad; tip of tail less bluntly rounded ..... **S. hymenopus**

#### THE TADPOLE OF *STRONGYLOPUS HYMENOPUS*

##### Diagnosis

Umbraculum present; spiracle large, round, directed dorsally or, sometimes, somewhat posterodorsally, fully visible from above; terminal fifth of tail not darkly pigmented; rostradonts deep, fully pigmented; keratodont formula<sup>1</sup> usually I-2+2/1+1-II.

##### Differential diagnoses

Readily separable from the tadpoles of *Rana vertebralis*, with which it has been found, the latter having 4 uninterrupted rows of infra-angular keratodonts, a flattened body and tail, and fins originating well behind the base of the tail.

Separable from *Strongylopus g. grayii* (Smith, 1849), which lacks an umbraculum; and from *S. wageri*, which has a keratodont formula of I-3+3/III, the margins of the fins more parallel, the terminal fifth of the tail usually darkly pigmented, and the papillae of the outermost row on the posterior border of the oral disc distinctly longer than the others.

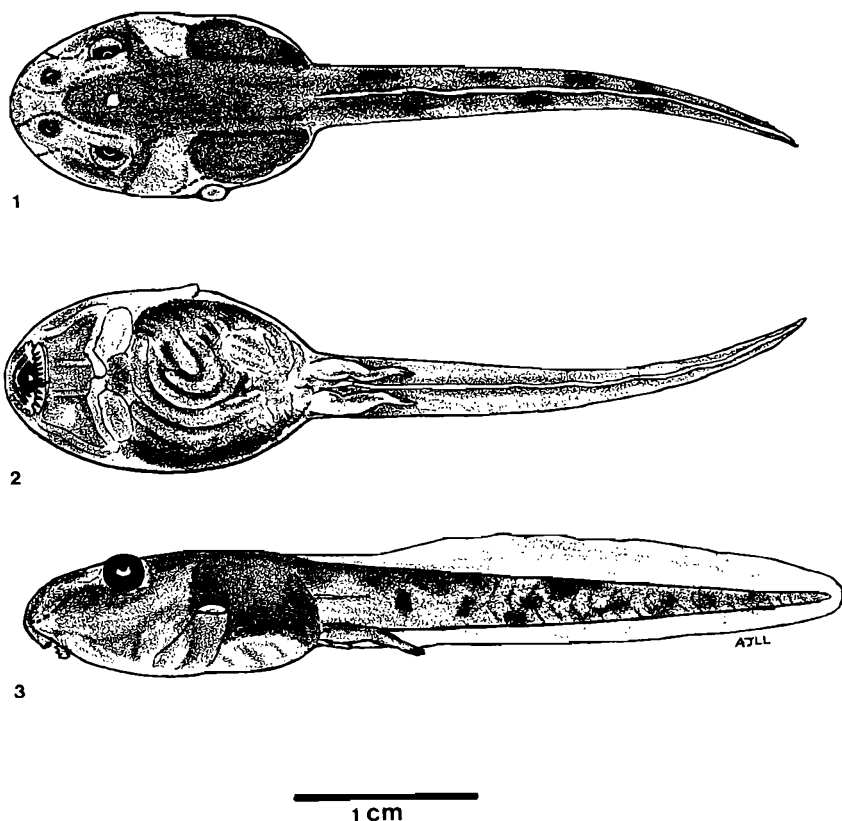
Separable from the tadpoles described and figured by Wager, as *Rana hymenopus*, by the lack of an umbraculum in the latter; by the shape and orientation of the spiracle, which is smaller, more oval and constricted, more posterodorsally directed, and not or only partly visible from above; and by the possession of usually three uninterrupted rows of infra-angular keratodonts.

##### Description

**Size:** Length 24,05 mm at stage 25 (NM 6007) to 50,70 mm at stage 36 (AJL 2253).

**Colours and markings:** Body dark brown dorsally and laterally, with blackish mottling, and white ventrally. Tail dark brown dorsally, lightening on sides, and with large rounded blotches, somewhat variable in size and arrangement; ventral

<sup>1</sup> In this notation of keratodont formulae, the figures to the left of the solidus (which represents the mouth aperture) indicate supra-angular keratodont rows and those to the right, infra-angular keratodont rows. Roman numerals represent the number of undivided (aboral) rows, arabic numerals represent the number of pairs of divided (adoral) rows.



Figs 1–3. Tadpole of *Strongylopus hymenopus*. (AJL 2331. Stage 37: Tugela River, 700 m NE Crow's Nest Peak.) 1. Dorsal view. 2. Ventral view. 3. Lateral view.

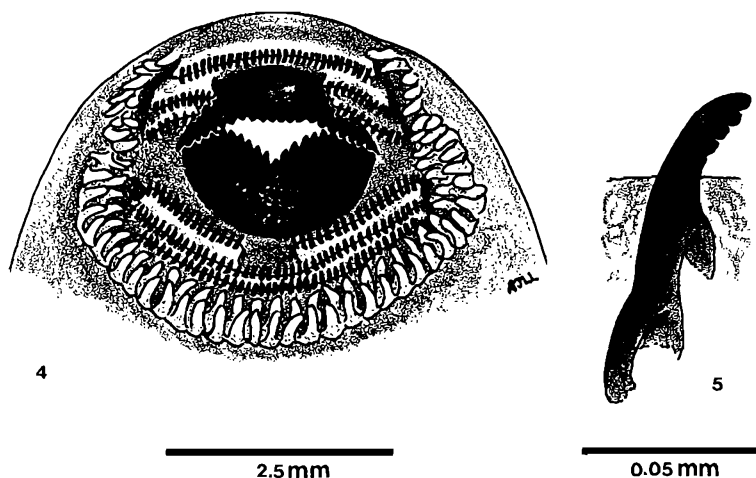
surface of tail whitish to pale buff, immaculate. Dorsal fin finely stippled, ventral fin more or less hyaline (Figs 1–3).

**Mouth:** Ventral, transversely elliptic; 0,26–0,36 width of head at level of disc (mean 0,31).

**Oral disc:** Subterminal, ventral, not visible from above; transversely elliptic; 0,68–0,88 width of head at level of disc (mean 0,79). Lateral margins transangular; not, or barely, indented.

Rostral gap 0,52–0,64 width of oral disc (mean 0,58). Oral papillae villiform; in a single row suprarostrally, and double to multiple infra-angularly; angular papillae in multiple or, sometimes, in double rows; no extramarginal papillae; a few intramarginal papillae in one tadpole from the NM 6007 sample (Fig. 4).

**Rostrodonts:** Suprarostrodont distinctly inflected and obtusely rounded medially; entirely keratinised and pigmented black, as in the other *Strongylopus* species. Width of suprarostrodont 0,49–0,61 width of oral disc (mean 0,54). Serrations fairly pointed; as long as, or slightly longer than, broad, and approximately normal



Figs 4–5. 4. Mouthparts of *Strongylopus hymenopus* tadpole, ventral view. 5. Infrarostral keratodont, in lateral view, from tadpole of *S. hymenopus*. (Data as Fig. 1.)

to the margin along the entire length of the free edge; length of serrations about 0,02 width of suprarostrodont (Fig. 4).

Infrarostradont acutely inflected medially, entirely keratinised and pigmented black. Depth 0,36–0,52 of width (mean 0,43). Serrations mucronate, about as long as broad, orientated approximately anteroposteriorly; length of serrations about 0,02 width of infrarostradont (Fig. 4).

*Additional keratinisations:* None present, but in one tadpole from the NM 6007 sample, the left supra-angular papillae appear to be partly keratinised.

*Keratodonts:* Formula usually I–2+2/1+1–II but I–2+2/III in two cases and I–2+2/2+2–I in one case.

Length of supra-angular keradont rows 1,13–1,32 width of suprarostrodont (mean 1,21); length of infra-angular keratodont rows 1,23–1,56 width of suprarostrodont (mean 1,21); length of infra-angular keratodont rows 1,23–1,56 width of infrarostradont (mean 1,4).

Keratodonts with single apex, slightly curved, and slightly expanded distally; not terminally serrate but slightly toothed near apex (Fig. 5).

*Nostrils:* Round. Margins slightly raised, without inflexions. Aperture level with general surface, directed dorsolaterally and slightly anteriorly, or anterolaterally. Pigmentation not distinctive. Nasal passages visible dorsally and laterally, partly visible anteriorly. Nasal chambers pigmented.

Internarial distance 6,58–10,05 of nostril width (mean 7,76). Extranarial proportion 0,53–0,87 (mean 0,75). Rostronasal distance 1,10–1,67 of orbitonasal distance (mean 1,31). Extranarial proportion 0,53–0,87 (mean 0,75).

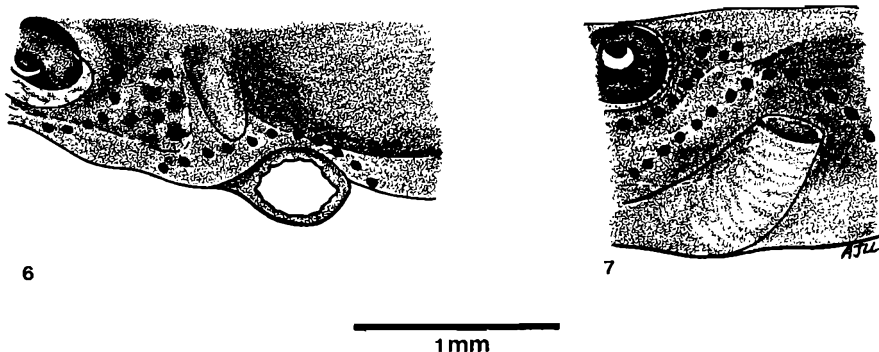
*Eye:* Umbraculum present, but only clearly discernible in specimens known to have been killed in bright light (Figs 6–7).

Extra-ocular proportion 0,35–0,60 (mean 0,56). Diameter of eye 0,38–0,51 of rostro-orbital distance (mean 0,44).

No visible orbitonasal line. Pineal spot usually present, but tiny; sometimes not visible under low ( $5\times$ – $10\times$  magnification) (Fig. 1).

*Neuromast organs*: Present on head and anterior part of trunk, but not very distinct; pores pigmented (Fig. 1).

*Spiracle*: Single, sinistral. Opening not raised; broad, round, not (or slightly) constricted; partly visible laterally, wholly visible from above; no scalloping or folding of margins. Tube and opening both directed dorsally or, sometimes, slightly posterodorsally (Figs 6–7).

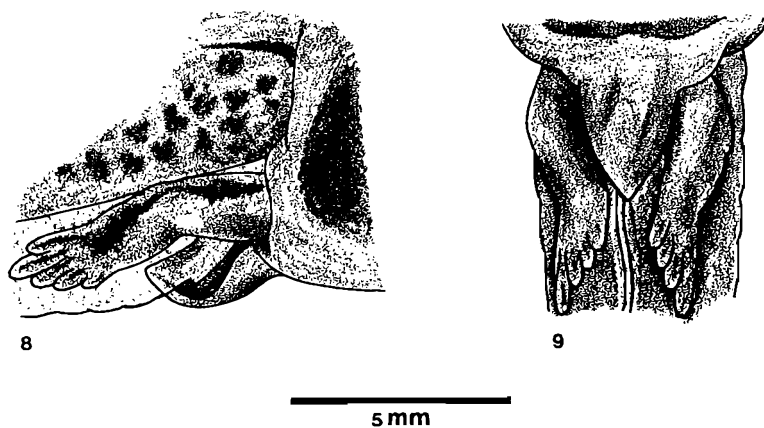


Figs 6–7. Spiracle of *Strongylopus hymenopus* tadpole. 6. Dorsal view. 7. Lateral view. (Data as Fig. 1.)

Anteroposterior position of spiracular opening 0,53–0,73 (mean 0,67) of head-trunk length.

*Vent*: Caudal. Aperture dextral and marginal, directed posterad-ventroposterad, subject to folding. Proctodaeal tube 1,14–2,18 width of vent (mean 1,61) (Figs 8–9).

*Tail*: Tail euthyoursal; the axis passes through the eye. Myomeres mostly or, rarely,



Figs 8–9. Vent of *Strongylopus hymenopus* tadpole. 8. Right lateral view. 9. Ventral view. (Data as Fig. 1.)

completely obscured by pigment; deepest basally. Tail length 1,54–1,85 of head-trunk length (mean 1,72). Tail height 0,56–0,87 of trunk height (mean 0,79). Maximum height of caudal muscles 0,38–0,63 height of trunk (mean 0,50).

Dorsal fin deepest at about mid-point and distinctly narrowed anteriorly; ventral fin usually deepest slightly anterior to mid-point, sometimes just posterior to mid-point; margins slightly convergent posterad. Maximum depth dorsal fin 1,26–1,37 maximum depth of ventral fin (mean 1,30). Tip bluntly pointed.

Dorsal fin stippled except for area around origin. Ventral fin stippled only terminally. No pigmented axial line.

*Hind limbs:* Hind limb buds or hind limbs not surrounded by skin folds, but a narrow skin fold, continuous with the proctodaeal tube, passes ventral to the limb buds in the earlier stages of development.

#### REMARKS

Newly metamorphosed froglets closely resemble more mature animals. Ground coloration in life varies from rather dark brown to grey-brown, with darker, somewhat rounded patches about half the diameter of the eye, scattered fairly densely over the back, or with dark mottling or marbling. The ventrum is white. Snout-vent length at metamorphosis is about 16 mm.

The diameter of the tympanum is less than the interorbital distance; width of head about 0,4 times body length; length of hind foot a little less than distance from tip of urostyle to axilla; two to three phalanges of fourth toe free of web.

The umbraculum is not present in mature post-metamorphic frogs. However, remains of an apparent elygium can be discerned in some cases in adult frogs if the upper eyelid is retracted, although it is not always easy to see. A living subadult held under a bright light for some time did not show any sign of an elygium.

Tadpoles previously considered by Wager to be those of *Strongylopus hymenopus* have been found to be based on a composite sample of two taxa. Statistical analysis of all features described above show clear separation in almost every respect, with poor separation only on the ratios of length of keratodont rows to widths of rostrodonts, and of tail height to trunk height. The absence of an umbraculum in 'Wager's tadpole', present in other local high-altitude taxa, is a feature of some interest and which requires further attention.

A full description of 'Wager's tadpole' and detailed comparison with that of *S. hymenopus* will be published when current investigations into the taxonomic status of this tadpole and its adult form are complete. It would appear, however, that this tadpole, manifestly of the genus *Strongylopus*, in view of the characteristically deep, wholly pigmented rostrodonts, represents the larval stage of an as yet undescribed taxon; it cannot be attributed to any named *Strongylopus* species known to occur in South Africa.

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